

prolec®



Flexible Large Autotransformer



Current Electrical Grid Conditions

Autotransformers connect AC transmission systems with different voltages to allow for the transfer of large bulks of electrical energy from generation to consumption centers. This role and their typical locations in remote areas make them both vulnerable and critical for the grid's operation.

Causes of failure:

- Transformer age (more than 33% of US transformers were manufactured more than 50 years ago)
- Weather events
- Vandalism or terrorist attack

Owner challenges:

- Replace failed units in a short period of time—typical lead time for a new transformer is one year or more
- Minimize asset management cost by limiting the number of spare units required for different voltages and impedance ratings





What if
there was
a **better**
technical
solution?



Product Development & Validation

Prolec GE developed a new patented technology to offer an autotransformer with a flexible impedance range with multiple low voltages.

Factory test validation

To validate this new technology, Prolec GE developed a full-scale prototype:

- 60/80/100 MVA, 165-57.5/69/80.5 kV, with on-load tap changer

The unit was fully tested according to ANSI/IEEE standards at all LV ratings: (three sets of dielectric tests), heat run, excitation, losses and noise.

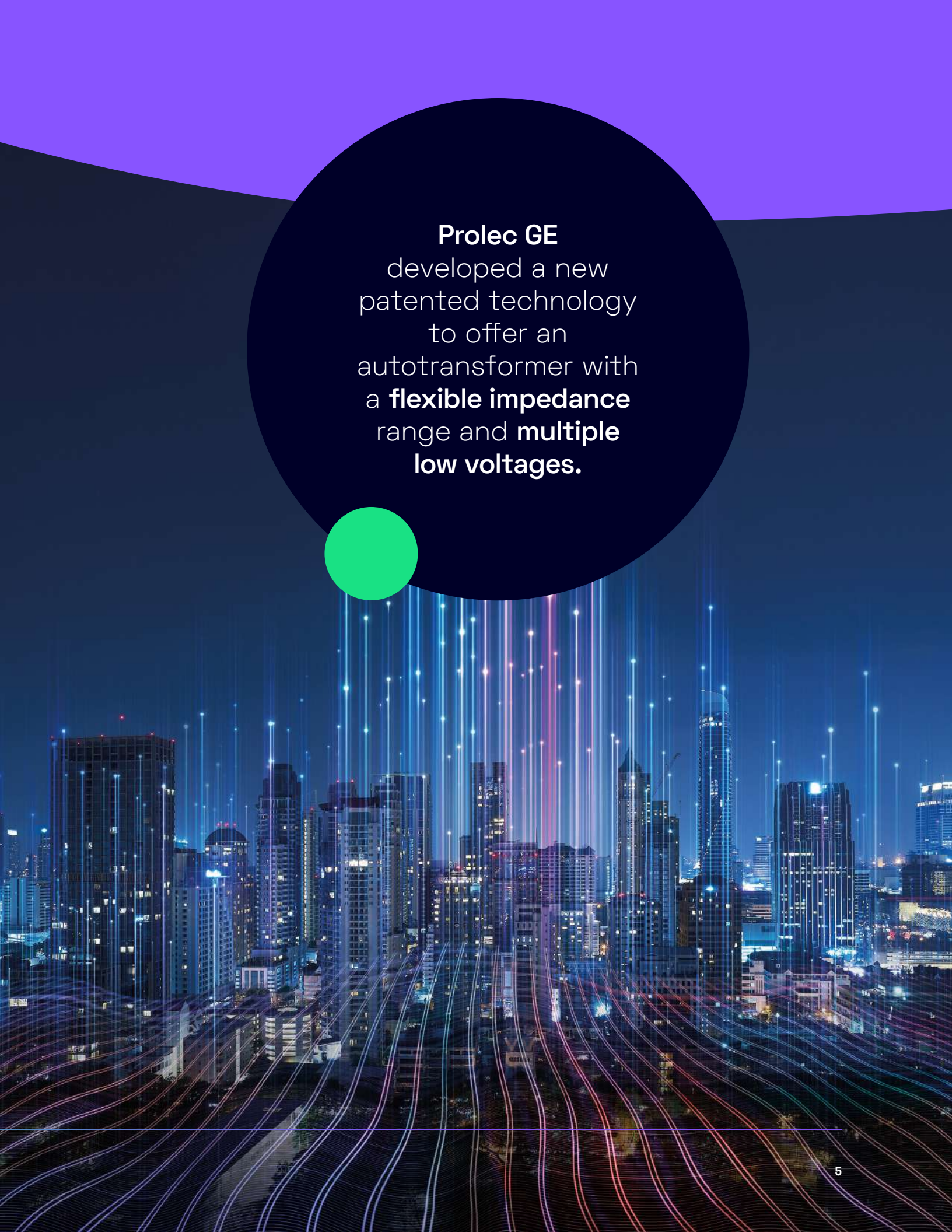
Field Validation

After factory test completion, the prototype was shipped to a US utility substation, where it was installed and energized. Field tests include continuous monitoring of critical performance parameters and on-line impedance variation to validate this feature in a real electrical grid condition.

Monitoring

Online 24 hour surveillance of critical parameters in the transformer:

- 35 sensors installed measuring load, voltage, gases, temperature, etc
- Remote data collection and analysis; all performance data is analyzed by **Prolec GE** technical team at the factory

The background of the page is a night cityscape with light trails from traffic and buildings. A large black circle is centered in the upper half, containing white text. A smaller green circle is positioned at the bottom left of the black circle.

Prolec GE
developed a new
patented technology
to offer an
autotransformer with
a **flexible impedance**
range and **multiple**
low voltages.

Product Scope and Benefits

Product Scope

- Application: Interconnection autotransformers
- Phases: 3 phase units
- Taps: OTLC and DETC
- Capacity: 80 to 750 MVA three phase (top capacity rating)
- Voltage rating HV: Up to 345 kV
- LV multiple ratings: 2 or 3 voltage ratings (up to 230kV)
- Impedance ranges: Between 6 to 12 pp of the Z% (i.e. from 4%-16%, depending on voltage ratio and system requirements)

Benefits

- Lower asset management cost for utilities
- Permanent replacement—avoid additional installation costs compared to temporary alternatives
- Designed to meet customer specifications and particular requirements
- On-line or de-energized Impedance change (based on customer preference)
- Additional benefits of on-line impedance change include improved short circuit withstand and better reactive power management in the substation
- Transformer health management with a complete set of sensors and remote monitoring

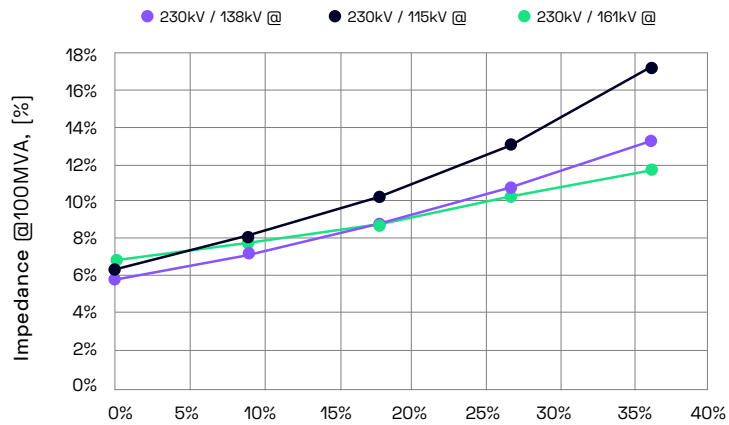


Remote monitoring of load, temperature and gases



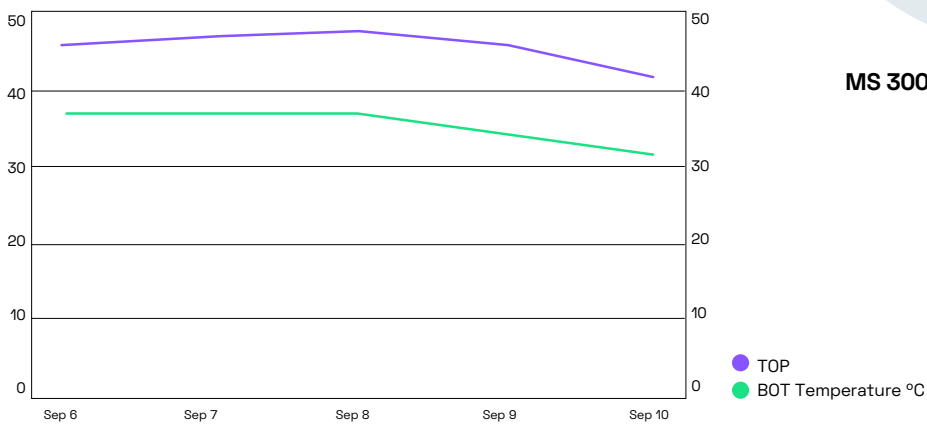
World's First Large Flexible Transformer

FLEXIBLE IMPEDANCE RANGE

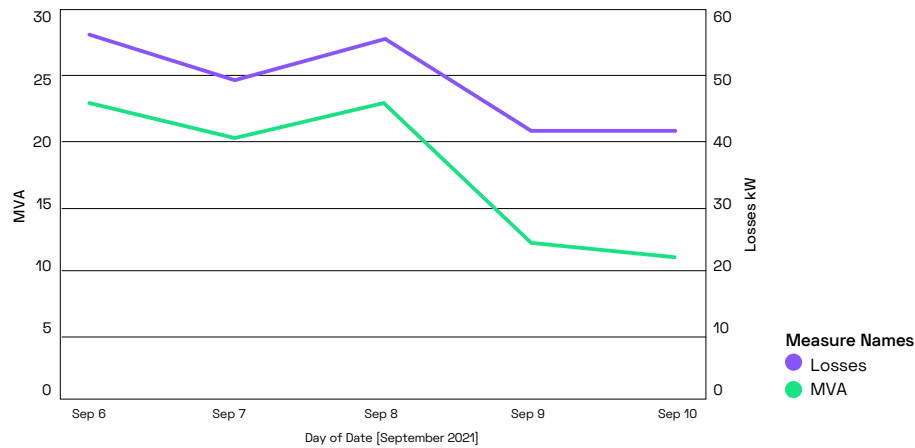


MS 3000 System - GE Grid Solutions

TOP AND BOTTOM OIL TEMPERATURE



LOAD & LOSSES





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For more information,
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